MEMORANDUM

DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF WATER PROGRAMS COORDINATION
OFFICE OF SPILL RESPONSE AND REMEDIATION

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SUBJECT: GUIDANCE MEMORANDUM 00-2013
Quality Assurance Project Plan for the Alternate Water Supply Program

TO: Regional Directors

FROM: Larry G. Lawson, P.E.

DATE: September 13, 2000

COPIES: Regional Storage Tank Program Managers, J. Andrew Hagelin, Fred Cunningham, Dave Chance, James Barnett, John Giese, Gary Du

The DEQ Storage Tank Program, as part of its grant commitment to EPA has developed and implemented a Quality Management Plan (QMP) to ensure that data collected by this program is of sufficient and known quality to support the decision making processes. The QMP identified two primary areas: (1) the Alternate Water Supply (AWS) Program, and (2) the State Lead Program, where Storage Tank Program Staff or Contractors hired by the Storage Tank Program collect environmental data. In accordance with the QMP, the attached Quality Assurance Project Plan for the AWS Program was developed to provide staff and the contractor(s) hired by DEQ with quality assurance procedures for the AWS Program.

A collaborative process was used to develop the Quality Assurance Project Plan (QAPP). The QAPP for the AWS Program was developed by the Storage Tank Quality Assurance Manager and the AWS Program Manager in OSRR. A draft of this document was then sent to the DEQ Quality Assurance Officer and each of the regional Storage Tank Program Managers for comment. Comments from the Quality Assurance Officer and Regional staff and managers were then incorporated into the QAPP.

The QAPP for the AWS Program will be placed on the DEQ Web Page. If you have any questions about the QAPP, please contact James Barnett.

DISCLAIMER

This document provides procedural guidance to the DEQ Storage Tank Program staff and contractors performing work for the Alternate Water Supply Program. This document is for guidance only. It does not establish or affect legal rights or obligations. It does not establish a binding norm and is not finally determinative of the issues addressed. Agency decisions in any particular case will be made by applying the State Water Control Law and the implementation regulations on the basis of the site-specific facts.

STORAGE TANK PROGRAM
Quality Assurance Project Plan – AWS Program

(September 7, 2000)

Document # 00-2013

Commonwealth of Virginia
Department of Environmental Quality

Quality Assurance Project Plan - AWS Program

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QUALITY ASSURANCE PROJECT PLAN
Alternate Water Supply Program

1.0 INTRODUCTION

Petroleum contaminated drinking water supplies represent instances of known receptor impact and must receive the highest level of priority and attention by staff. The Department of Environmental Quality (DEQ) Storage Tank Program investigates reports of petroleum in drinking water and provides alternate water supplies when and where appropriate.

Upon receiving a report of a potentially impacted water supply, DEQ staff and/or contractors will usually collect samples from the water supply. DEQ staff members also have the authority to require persons responsible for petroleum releases to determine if nearby water supply wells are contaminated. If the water supply is contaminated, the DEQ may provide an alternate water supply or a treatment system to remove petroleum from the existing water supply.

The purpose of this Quality Assurance Project Plan is to ensure that procedures used and data collected by DEQ staff and DEQ hired contractors during the investigation of potentially impacted water supplies are of sufficient quality to support the decisions about the need to provide alternate water supplies to persons having wells that are impacted by petroleum.

2.0 PROJECT DESCRIPTION AND MANAGEMENT

Staff members from the DEQ Storage Tank Program Water Program are responsible for investigating reports of petroleum contamination in water supply wells. Upon receiving a report of petroleum contamination in a water supply well, DEQ staff will contact the operator of that well to obtain additional information and schedule a site visit. Staff will visit sites where water supply wells are reportedly impacted within five working days of receiving the report. Staff members have the option of collecting water samples during site visits. All samples by DEQ staff will be submitted to the Division of Consolidated Laboratory Services (DCLS) for analysis. Regional staff may contact the AWS Program Manager and request that the Carbon Filtration Unit contractor visit the site and collect samples.

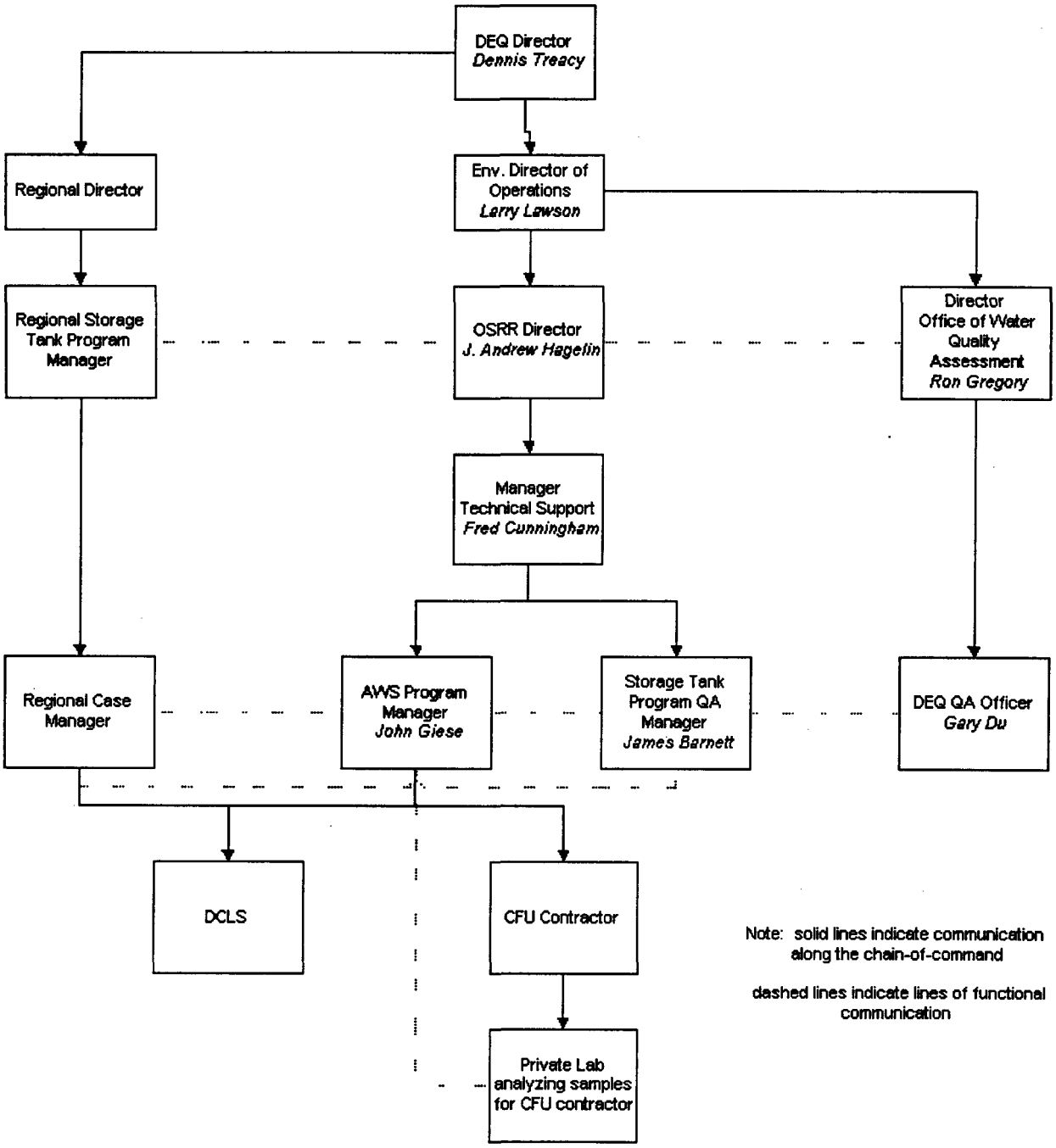
The schedule for deciding whether to provide an alternate water supply or water treatment system for the existing water supply is based upon site-specific conditions. If the water supply is obviously contaminated by petroleum, regional staff will notify the AWS Program Manager in OSRR that the water is contaminated prior to receiving the analytical results. Unless the staff investigating the contaminated water supply report are sure that the water is contaminated by petroleum, the DEQ will wait until analytical results are received before deciding whether to provide an AWS.

2.1 Project Responsibilities

When a potentially contaminated water supply well is reported to DEQ, Storage Tank Program staff and managers must investigate the report and ensure that the necessary actions are taken to provide potable water to the impacted party. The Storage Tank Program retains a Carbon Filtration Unit (CFU) contractor to install and maintain treatment systems on impacted water supplies. This CFU contractor may also be used to assist DEQ with the investigation (sampling) of potentially impacted water supplies. The DEQ also may provide bottled water on an interim basis until the CFU is operational.

All persons involved with the AWS program are responsible, either directly or indirectly, for the quality of data generated as part of this program and for the decisions that are made based upon the data that is collected. Sections 2.1.1 through 2.1.7 describe the roles and responsibilities of DEQ staff, managers, and the CFU contractor in the AWS program. Figure 1 illustrates the lines of formal and functional communications within the AWS Program.

Figure 2-1. AWS Program Organizational Chart



2.1.1 Regional Case Manager

Petroleum releases must be reported to the appropriate DEQ Regional Office. Upon receiving a report of a petroleum contaminated water supply, the Regional Storage Tank Program Manager will direct one of the Regional Case Managers to investigate the report. The individual Case Manager to which a contaminated water supply report is assigned is responsible for investigating the report and working with other DEQ staff to determine if an AWS needs to be provided. The Case Manager will, as part of the investigation, conduct a site visit within **5** working days of receiving the report. During the site visit, the Case Manager will collect information about the site and attempt to determine if petroleum constituents are present in the water supply.

The Case Manager may collect water samples during the site visit and subsequently submit those samples to the Department of General Services, Division of Consolidated Laboratory Services (DCLS) for analysis. If the Case Manager believes that petroleum constituents are present in the water supply, he/she must contact the AWS Program Manager in OSRR. The AWS Program Manager may, at this point, direct the CFU contractor to take samples and collect information needed to design a treatment system for the site should one be needed.

Site Characterizations led by the responsible person (RP) may also involve the collection of data from water supply wells. If the Case Manager believes that water supply wells near a release may be impacted, the Case Manager may direct the RP to collect water samples from water supply wells as part of the Site Characterization process. The Case Manager may accompany the responsible person (RP) or the RP's consultant when samples are collected and may also split samples with the RP/consultant.

When a water supply is impacted by petroleum, the Case Manager will continue with the Site Characterization and Corrective Action process. If the person responsible for the contamination is known, the Case Manager will work with that person to characterize the release and undertake corrective actions needed to address risks posed by the release. The RP must, as part of corrective action, provide the impacted person(s) with a petroleum free water supply. If the RP is not known, the site will be placed in the State Lead Program and the Case Manager will work with the State Lead contractor to characterize the contamination and take the corrective actions that are necessary to protect human health and the environment.

Quality control is a major component of the Case Manager's duties. Samples collected by the Case Manager or other DEQ staff must meet the data quality objectives. In most instances, samples will be collected in accordance with standard procedures and Case Managers are expected to be familiar with sampling procedures before samples are collected. The Case Manager has the authority to modify the procedures on a site-specific basis in order to meet the data quality objectives at the individual site.

2.1.2 AWS Program Manager

Storage Tank Program staff in both the regional offices and OSRR share in the responsibilities for implementing the Alternate Water Supply (AWS) Program. Management of the CFU contract for the AWS Program is administered by the AWS Program Manager.

When Regional staff investigate a potentially impacted water supply and evidence indicates that the water supply is contaminated by petroleum, they contact the AWS Program Manager. The AWS Program Manager then directs the CFU contractor to visit the site and collect water quality samples and other site specific information related to the existing water supply. The purposes of the site visit are to: (1) confirm the presence of petroleum constituents in the water supply; and (2) obtain the information needed to design an appropriate water treatment system for the site. Once a carbon filtration system is installed at a site, the AWS Program Manager and the CFU contractor decide upon an appropriate operation and maintenance (O&M) schedule for the treatment system. This O&M schedule includes the collection of additional water samples.

Standard operating procedures for the AWS program are developed jointly by the Storage Tank Program personnel in OSRR and the Regional Offices. The AWS Program Manager is responsible for coordinating the development of standard procedures for the AWS program and modifying existing procedures as needed. The AWS Program Manager along with other Central Office Staff must assist the Regional Case Manager as needed with release investigations and the evaluation of corrective action plans for impacted sites.

Quality assurance documents for the AWS Program will be developed jointly by storage Tank Program Staff from OSRR and the Regional Offices. The AWS Program Manager must assist the Storage Tank Quality Assurance Manager with the development of QA/QC procedures for the AWS Program.

2.1.3 OSRR Staff and Management

Technical guidance and procedures within the DEQ Storage Tank Program are developed jointly by OSRR staff/management and regional staff/management. Once a procedure is agreed upon by OSRR and the regions, OSRR staff and management provide a written copy of the guidance or procedure to OSRR and Regional staff.

OSRR staff and management are also responsible for developing the quality assurance documents that are needed within the Storage Tank Program. As with other technical documents, OSRR staff must incorporate comments from other Central and Regional Office staff into the Quality Assurance documents. OSRR staff must update and revise quality assurance documents as needed.

2.1.4 Regional Storage Tank Program Manager

The Regional Storage Tank Program Manager is responsible for overseeing all activities performed by Storage Tank Program staff in that region. The Regional Storage Tank Program Manager assigns reports of contaminated water supplies to individual Case Managers and ensures that reports of contaminated water supplies are investigated in accordance with DEQ procedures.

The Regional Storage Tank Program Manager and/or a person designated by the Regional Storage Tank Program Manager is responsible for assisting OSRR with the development, review, and revision of program procedures. The Regional Storage Tank Program Manager is also responsible for ensuring that all staff performing work on a project are familiar with Storage Tank Program standard procedures.

2.1.5 DEQ Carbon Filtration Unit Contractor

The CFU contractor hired by DEQ to install and maintain treatment systems on petroleum impacted water supplies is an integral component of the Quality Assurance process. At most AWS sites, the CFU contractor will collect more environmental data related to the AWS system than any other entity. The CFU contractor usually will collect samples from the water supply prior to installing a treatment system. These samples will be analyzed for petroleum constituents and general water chemistry so that a treatment system may be effectively designed for the site. Once a treatment system is installed, regular O&M performed on the system usually includes the collection and analysis of water samples to monitor current contamination levels in the water system and evaluate the effectiveness of the treatment system at removing the contaminants.

During O&M, samples are generally collected from the water system prior to and after the primary carbon filters in order to monitor the effectiveness of the unit. Samples collected from pre-filter locations provide DEQ and the CFU contractor with information about current contamination levels in the water supply. As a matter of procedure, DEQ usually instructs the CFU contractor to remove treatment systems from sites that have shown no detectable concentration of petroleum constituents for at least one year/four quarterly sampling events.

2.1.6 Storage Tank Program Quality Assurance Manager

The Quality Assurance Manager for the Storage Tank Program is responsible for developing, maintaining, and updating all quality assurance documents for the AWS Program. This person also must:

1. distribute quality assurance documents, policies, and procedures;
2. assess the effectiveness of quality assurance procedures for the AWS Program;
3. identify deficiencies in the quality assurance process and determine the actions needed to correct those deficiencies; and
4. identify training needs and report those needs to the Director of OSRR and the Regional Storage Tank Program Managers.

The Storage Tank Program Quality Assurance Manager also may assist the AWS Program Manager with the development, review, and revision of AWS procedures. The Storage Tank Program Quality Assurance Manager is also available to assist the Regional Case Managers as needed.

2.1.7 DEQ Quality Assurance Officer

The DEQ Quality Assurance Officer will review quality assurance documents developed by the Storage Tank Program and assist the Storage Tank Quality Assurance Manager with auditing and assessing QA/QC procedures used by this program. The DEQ Quality Assurance Officer is outside of the Storage Tank Program chain-of-command and is expected to add a level of objectivity to QA/QC reviews and audits.

The DEQ Quality Assurance Officer reviewed and approved the Quality Assurance Project Plan for the Alternate Water Supply Program before the plan was completed. The Quality Assurance Officer will also be involved in the review of all major revisions of this Project Plan.

Technical System Audits and Management System Reviews of the AWS Project Plan will be coordinated by the Storage Tank Program Quality Assurance Manager. The DEQ Quality Assurance Officer will assist with Technical System Audits and Management System Reviews.

2.2 Data Quality Objectives

Petroleum contaminated drinking water supplies represent instances of known receptor impact. The DEQ may provide an AWS whenever petroleum constituents (including gasoline additives such as MTBE) are detected in water supply wells. The DEQ will, as a general practice, provide an AWS when private wells are impacted by petroleum and petroleum constituents are the primary constituents of concern.

Data quality objectives are primarily based upon the decisions that the data must support. Data collected for the AWS program may be utilized for the purposes of: (1) determining if a well has been impacted by petroleum constituents; (2) designing a treatment system to remove petroleum constituents from a water supply; (3) ensuring that the system is operating as designed (detect breakthrough of petroleum contamination); and/or (4) determining if a CFU is still needed at the site. The decisions that must be made do determine if a well is impacted by petroleum are different from the decisions that must be made to design a system or to ensure that the system is performing as expected. The data quality objectives for data collected as part of the AWS Program vary depending upon the decisions that must be made.

2.2.1 Data Quality Requirements Private Water Supply Wells

Operators of private water supply wells are not required to test water in those wells for petroleum or other organic constituents. When a well is reportedly contaminated by petroleum, DEQ staff must investigate the report and determine if petroleum constituents are present in the well. If a potentially responsible person for the petroleum contamination is known, DEQ will require that person to collect samples and determine if the well has been impacted by petroleum. If the potentially responsible person is unable or unwilling to collect samples, samples will be collected by DEQ staff and/or the CFU contractor. DEQ staff may, at their discretion, also split samples with the potentially responsible person.

The primary objective of sample collection and analysis is to determine if a private water supply well has been impacted by petroleum. A secondary objective of sample collection and analysis is to determine if contaminants other than petroleum constituents are present in the water supply.

The Storage Tank Program usually will provide an AWS when private water supplies are impacted by petroleum and petroleum constituents are the primary constituents of concern in the well. Analytical results must indicate if petroleum constituents and/or contaminants other than petroleum constituents are present in a water supply well. False negative analytical results will result in a decision by DEQ not to supply a treatment system and may result in the exposure of a receptor to petroleum constituents.

DEQ AWS procedures require the continued maintenance of a CFU and the sampling of the system at that site for a specified period (usually one year) after petroleum constituents are no longer found in the well. False positive analytical results will cause DEQ to install and/or maintain a treatment system at the impacted residence for one year after petroleum was last detected in the water supply. The installation and maintenance of a CFU in a location where one is not needed is a needless use of a limited resource.

When a private water supply well has been impacted by both petroleum and non-petroleum constituents, the DEQ Storage Tank Program will evaluate the relative risks from the different types of contaminants. Analytical results must be as close to the actual concentrations of the constituents as possible so that the DEQ may compare the concentration of each constituent with its drinking water standard. If the DEQ believes that the non-petroleum constituents are the primary constituents of concern in a well, the Storage Tank Program may decide not to provide an alternate water supply.

2.2.2 Data Quality Requirements - Public Water Supplies

Public water supplies are regulated by the Virginia Health Department and operators of these water supply systems are required to test for contaminants (including petroleum constituents) on a routine basis. The DEQ will, as a general practice, provide an AWS or assistance to the operator of a public water supply well when that well is contaminated by petroleum, the concentration of one or more of the petroleum constituents exceeds the Virginia Health Department standards for public water, and the petroleum constituents are the primary constituents of concern.

DEQ staff and/or the CFU contractor may collect water samples from public water supplies for the purposes of: (1) verifying information provided by the operator of the water supply system; and/or (2) obtaining additional information on which to base the decision to provide an AWS. Accuracy is, perhaps more important for these samples than for others collected as part of the AWS Program. DEQ's decision to provide a carbon filtration unit for an impacted public water supply is based upon the measured concentration of constituents in the sample. It is important, therefore, that the measured concentration be as close to the true value as possible.

NOTE: Public water may be supplied by a series of wells or well field. In those instances where water is supplied by multiple wells, the Storage Tank Program will routinely base its decision to supply a filtration system on the basis of the concentration of petroleum constituents at the compliance point (the location where water from single or multiple sources enters the distribution system as defined by the Virginia Water Works Regulations).

2.2.3 Data Quality Requirements - Treatment System Design

The primary carbon filtration unit (CFU) design parameters are water throughput or usage and contaminant species and concentration. Secondary CFU design parameters are water chemistry measurements such as total iron, manganese, sulfate, hardness, and pH. The contaminant concentrations are derived from laboratory analysis of one or more water samples, and the water chemistry is obtained from on-site sample screening and/or laboratory analyses.

The primary and secondary design parameters in concert with empirical data from other CFU sites allow for an approximate system design. Final system design is achieved through monitoring system performance and making system modifications as necessary.

2.2.4 Data Quality Requirements - Treatment System Operation and Maintenance

Once a treatment system has been installed to remove petroleum from a potable water supply, the CFU contractor must monitor and maintain the system to ensure that the system is removing petroleum as designed. Samples are often collected as part of the process of maintaining the system. The CFU contractor usually collects raw water samples from prior to the carbon filtration units to monitor contaminant concentrations in the well and also collects samples from between the primary and secondary carbon treatment units to ensure that contaminants have not "broken through" the carbon.

DEQ, as a matter of procedure, will maintain carbon treatment units on a water supply until petroleum constituents in the water supply remain below the detection limits for at least one year. Data from the raw water samples must be able to support decisions about terminating the CFU system at the site or, if contaminant concentrations increase significantly, re-designing the system to remove the increased contaminant mass.

Information from samples collected after the CFU will be used to determine the schedule on which the system should be monitored and one or more treatment tanks should be replaced. If petroleum constituents, in any concentration, are detected in the sample collected from between the primary and secondary treatment tanks, all of the treatment tanks will be replaced.

2.3 Training Requirements

The AWS Program must have data of a sufficient and known quality in order for DEQ to protect human health and the environment. Obtaining data of such quality requires that the persons collecting the data use procedures that will ensure the integrity of that data. DEQ staff and personnel collecting data for the CFU contractor must be familiar with and use established sample collection procedures in order to ensure that the data collected meets the AWS Program Data Quality Objectives.

2.3.1 Training Requirements - DEQ Storage Tank Program Staff

DEQ Storage Tank Program staff do not, as a general rule, collect samples on a regular basis. They may not, therefore, always be most familiar with procedures for sample collection, handling, and analysis. Regional Storage Tank Program Managers must ensure that staff assigned to investigate reports of contaminated water supplies are familiar with and have copies of current AWS Program procedures.

When impacted water supplies are reported to DEQ, the Storage Tank Program staff will investigate the report and determine if the well is impacted by petroleum. As a matter of course, analytes that DEQ and the CFU contractor look for in water samples include the more soluble petroleum constituents as these are the constituents that would most likely be detected if the well was contaminated by one of the petroleum products. Petroleum additives such as MTBE are among the most soluble constituents and DEQ and the CFU contractor will routinely analyze samples for MTBE when gasoline is a suspected contaminant source. New additives are periodically placed in petroleum products and DEQ staff need to be aware of these new additives so that samples can be analyzed for the most appropriate constituents.

2.3.2 Training Requirements - CFU Contractor

Data quality objectives for the AWS Program are established by DEQ. Samples collected for the AWS program must meet the data quality objectives. Sample collection procedures for determining if a water supply has been impacted by petroleum constituents or additives are established by DEQ. Procedures for analyzing water samples for general water chemistry are determined primarily by the test kit and/or instrument(s) used and persons analyzing samples in the field are expected to follow the manufacturer's instructions for the test kit and/or instrument used. The CFU contractor must provide DEQ with a list of field test equipment used and instructions for operating that equipment.

The CFU contractor must either provide DEQ with standard sample collection procedures that will be used by CFU personnel or use sampling procedures outlined in Section 3.1.2. Personnel collecting samples for the CFU contractor must be familiar with and follow the sample collection procedures in order to ensure data quality. These persons must be trained or otherwise know how to use the test kits and instruments that will be used in the field to evaluate water chemistry. During site visits, persons collecting data in the field are expected to record information about the site. They must be informed as to the types of information that must be recorded and the disposition of that information.

The CFU contractor is responsible for ensuring that personnel collecting samples are knowledgeable of the standard sample collection procedures at AWS sites. Documentation that these persons have received sample collection training and written copies of the standard sampling protocols must be provided to the AWS Program Manager.

2.4 Documentation Requirements

2.4.1 Field Notes

DEQ Storage Tank Program staff visiting the site are responsible for recording information about the site and any samples collected. Staff are expected to record information collected from the site in a bound field notebook. Entries into the field notebook will be recorded in indelible ink. Field notes should include:

1. a site map,
2. description of potential contaminant sources,
3. a general description of the water supply system at the site,
4. sampling location(s) and sample collection procedures,
5. date and time that the site visit was performed and samples were collected, and
6. the names of any personnel who accompanied the sampler.

Each page of field notes collected for a site should contain the pollution complaint number for the case and be initialed by the investigator and dated. Copies of all field notes must be placed in the appropriate pollution complaint file in the regional office.

The CFU contractor also may record field notes during site visits. All field notes collected by the CFU contractor will be recorded in indelible ink on a standard field sheet that is used by the contractor. Each page of field notes collected by the CFU contractor should contain:

1. the PC# and site name,
2. the date, and
3. the signature of the person recording the information.

Copies of all field notes recorded by the CFU contractor must be provided to the AWS Program Manager.

2.4.2 Sample Analysis Requests

Samples collected by DEQ staff will be submitted to DCLS for analysis. Sample analysis request forms (lab sheets) must be submitted to DCLS for each sample. A lab sheet must be filled out for each sample collected. Please see Appendix A for the current lab sheet and instructions for completing the lab sheet.

2.4.3 Chain-of-custody

Once a sample is collected, precautions must be taken to preserve the sample's chemical and physical integrity during transport to the lab and storage prior to analysis. DEQ staff and the CFU contractor are responsible for documenting that the integrity of the samples has been maintained during transport to and storage at the lab.

The person collecting samples in the field is responsible for custody of those samples until those samples are placed in a cooler (or other appropriate shipping container) along with the necessary documentation and released directly to a courier or the laboratory. From this point forward, the laboratory is responsible for custody of the samples.

2.4.3.1 Chain-of-custody - DEQ

DEQ staff will routinely document chain-of-custody through the lab tag that is affixed to each sample container. One side of the lab tag indicates the persons having custody of that sample container and the time that custody changed from one person to another. The procedure for documenting chain-of-custody is as follows:

1. The person collecting the sample must complete the lab tag for that sample.
2. If custody of the sample is transferred from the sampler to another person, the person accepting custody of the sample must place his/her name in the next line on the lab tag and indicate the date and time that sample custody was transferred.
3. If the sample will be transported to DCLS (or another lab) by a courier, the waybill will serve as an extension of the Chain-of-custody record between the final field custodian and receipt of the sample(s) in the lab. The sender's copy of the waybill should be placed in the appropriate case file with copies of all lab sheets. The waybill tracking number should also be entered in the sampler's field log book.

The collection of samples under DEQ legal protocol is primarily performed for enforcement purposes and is an activity not routinely performed by Storage Tank Program Staff. In the rare instances that Storage Tank Program staff must collect "legal samples," they will use the procedures outlined in the DEQ Water Sampling Manual.

2.4.3.2 Chain-of-custody - CFU Contractor

When the CFU contractor sends samples to a laboratory, the following procedures should be used to document custody of the sample:

1. A Chain-of-custody form must be completed for all samples collected.
2. The Chain-of-custody form should be signed by each individual who has the samples in his/her possession.
3. If samples must be placed in multiple coolers, a separate Chain-of-custody form must be used for the samples in each cooler.
4. If the samples will be sent to the lab via a courier (i.e., commercial carrier)
   a. the original of the Chain-of-custody form and one copy should be placed in a watertight plastic bag inside the cooler (or other appropriate shipping container). It is recommended that this plastic bag then be taped to the lid or top of the shipping container.
   b. One copy of the Chain-of-custody form must be retained by the person collecting the samples and subsequently, placed in the appropriate case file.
   c. the waybill will serve as an extension of the Chain-of-custody record between the final field custodian and receipt of the sample(s) in the lab.
   d. the sender's copy of the waybill should be stapled to and placed in the appropriate case file with the sampler's copy of the Chain-of-custody form.
   e. the waybill tracking number should be entered on the Chain-of-custody form and in the field log book.
5. If the samples are transported directly to the lab by the CFU contractor:
   a. When samples are transported directly to the lab by the person who collected the samples, that person should initial the "Relinquished by" block on the form upon arrival at the lab.
   b. The person at the lab receiving the samples should then initial the "received by" block on the Chain-of-custody form.
   c. When the samples are transported to the lab by someone other than the person collecting the samples, the person who collected the samples must initial the "relinquished by" block on the form and the person who will transport the samples to the lab must initial the "received by" block.
   d. Upon arrival at the lab, the person transporting the sample(s) will initial the second "relinquished by" block on the Chain-of-custody form and the person at the lab will initial the second "received by" block on the form.

2.4.4 Analytical Results

Analytical results provided to DEQ must be submitted on laboratory letterhead and signed by a person responsible for analyses performed by the lab. The analytical sheet(s) also must list the method used, detection limits, sample dilution (if applicable), and date(s) on which the sample was analyzed.

Analytical results for samples collected by regional staff should be sent to that Regional Office. The laboratory sheets received by DEQ regional staff will be placed in the appropriate case file at the Regional Office. Regional staff will send a copy of the lab sheet(s) to the AWS Manager when the case is referred to OSRR.

Analytical results for samples collected by the AWS Program Manager or OSRR staff, will be sent to the AWS Program Manager. Analytical results for samples collected by the CFU contractor will be sent to the CFU contractor who will forward copies of the lab sheets to the AWS Program Manager. The AWS Program Manager will place all lab sheets received in the appropriate case file(s) in OSRR. The AWS Program Manager will provide copies of analytical results from samples collected by the CFU contractor or OSRR staff to the Regional Office if this information is requested. Copies of samples collected to assess filtration system performance will be furnished to the region upon request.

3.0 DATA ACQUISITION

3.1 Sample Collection Process

Water supply wells that are potentially impacted are investigated by the DEQ Storage Tank Program staff. A major component of most investigations involves the collection of one or more water samples from the potentially impacted water supply. Samples may be collected by the potentially responsible person (i.e., a nearby entity that had a petroleum release), DEQ staff, and/or the CFU contractor.

3.1.1 Samples Collected by DEQ Staff

During the process of investigating a potentially impacted water supply, DEQ staff have the option of collecting samples and having those samples analyzed by DCLS lab or having the responsible person (if known) or the CFU contractor collect and analyze the samples. Staff may also decide to split samples with either the responsible person or the CFU contractor. Although not required, staff are encouraged to split samples with the responsible person when that entity will collect samples from potentially impacted water supplies.

A general procedure that DEQ staff will use for collecting samples from potentially impacted water supply wells is listed below. DEQ staff may modify this sampling procedure as appropriate to fit site specific conditions and objectives.

1. Investigation of possible petroleum contamination in a water supply well is initiated
   a. The DEQ receives a report of petroleum contamination (actual or potential) in a water supply well.
   b. There are water supply wells in the vicinity of a known petroleum release and the Regional Case Manager and Regional Storage Tank Program Manager decide that DEQ will collect samples from those wells to determine if they have been impacted by petroleum.
2. The Case Manager or other DEQ staff will contact the operator of the impacted well, obtain information about the site, and schedule a site visit. Prior to visiting the site, the Case Manager should (if possible) obtain the following types of information from the operator of the potentially impacted well:
   a. Types of potential contaminant sources near the well.
   b. Temporal variability (if any) of the contaminant.
      Staff must consider temporal factors when collecting samples from a potentially impacted water supply. If the reported water supply problem is intermittent, staff should, to the extent possible, work with the impacted party to ensure that samples are collected at a time when the problem is present.

3. The Case Manager or other DEQ staff will prepare sample containers with the appropriate preservative(s). Staff should be prepared to collect samples for both volatile and semivolatile constituents unless they have personal knowledge of the site that makes this unnecessary.
4. Upon arrival at the site, the Case Manager or other DEQ staff will determine the location from which to collect samples. Samples from the water supply system will be collected from the location that is closest to the system pressure tank as possible and is prior to any water filtration conditioning equipment. Most pressure tanks have a drain valve on or in very close proximity to the tank. This is generally the most optimal location from which to sample water from the well. Staff should be aware that, in most cases, a garden hose will have to be connected to this drain in order to prevent flooding of the space where the pressure tank is located. If it is not practical to collect samples from the pressure tank, samples should be collected from the outside spigot or inside faucet closest to the pressure tank.
5. If the sampling location is an indoor faucet, the Case Manager will remove any aerator from the faucet prior to collecting the sample. Passing water that contains volatile organic compounds (VOCs) through an aerator may result in the loss of some of the volatile compounds. Aerators also may be primary sources of microbial activity within the system. Microbial activity may compromise or bias sample quality.
6. Whenever possible, staff should purge the system for approximately ten (10) minutes prior to collecting water samples. Water samples should not be collected until cool water at a stable temperature is leaving the system. This stable, cool temperature indicates that the water was recently drawn from the aquifer/casing storage.
7. The person collecting the sample will don clean, unpowdered latex gloves before collecting samples.
8. When filling sample vials for VOC analyses, the vials should be filled slowly and not allowed to overflow so as not to lose volatiles and/or a sufficient level of sample acidification. Vials should be filled until there is a positive meniscus of liquid above the vial. The vial should then be capped and subsequently, inverted and tapped to check for air bubbles in the sample. If air bubbles are observed, staff should collect another sample.
9. Fill out a lab tag for each sample, affix the tag to the corresponding sample container, and place the samples in a cooler on ice. Instructions for completing the lab tags are included in Appendix A. Be sure to separate the samples from the ice (e.g. place the samples in plastic bags) and wrap or otherwise protect the samples to reduce the possibility of sample container breakage during transport.
10. Fill out a DCLS lab sheet for each sample collected. Instructions for completing a DCLS lab sheet are included in Appendix A. It is recommended that staff record pertinent notes on the DLCS sheet such as "water smells like sewage," "possible sources of contamination include kerosene and # 2 fuel oil", etc.

Table 3-1 - Analyses of samples collected by DEQ Staff

contaminant	Gasoline (known)	Gasoline (suspected)	kerosene, diesel, or fuel oils	unknown
Analytical method(s)	BTEX (and MTBE)	Volatile Organics (and MTBE) by GC/MS	Semi-volatile Organics by GC/MS	A. Volatile Organics (and MTBE) by GC/MS
				B. Semi-volatile Organics by GC/MS
Quantification Limit	1.0 ug/l (BTEX) 5.0 ug/l (MTBE)	1.0 ug/l (VOCs) 5.0 ug/l (MTBE)	5.0 ug/l (SVOCs)	A. 1.0 ug/l (VOCs) 5.0 ug/l (MTBE)
				B. 5.0 ug/l (SVOCs)
Sample Volume	2 x 40ml	2 x 40 ml	2 x 1liter	A. 2 X 40ml (VOCs)
				B. 2 x 1liter (SVOCs)
Container	glass 40 ml vial with Teflon cap liner	glass 40 ml vial with Teflon cap liner	glass amber liter bottle with Teflon cap liner	A. glass 40 ml vial with Teflon cap liner (VOCs)
				B. glass amber liter bottle with Teflon cap liner (SVOCs)
Preservation and Storage	preserve with HCL to pH≤ 2 and store at 4 ° C (add ascorbic acid if chlorine is expected)	preserve with HCL to pH≤ 2 and store at 4 ° C (add ascorbic acid if chlorine is expected)	store at 4 ° C	A. preserve with HCL to pH≤ 2 and store at 4 ° C (add ascorbic acid if chlorine is expected) (VOCs)
				B. store at 4 ° C (SVOCs)
Holding Time	14 days	14 days	7 days	A. 14 days (VOCs)
				B. 7 days (SVOCs)
Analyses will be performed by DCLS				

11. Record at least the following information about each sample in the field notebook:
    a. sample location
    b. station ID (must match station ID listed on lab tag and lab sheet)
    c. time collected
    d. preservation method (if any)
    e. other observations as deemed important by the sampler (e.g. water from the tap smelled like gasoline)
12. Place a lab sheet for each sample container in a watertight plastic bag and affix the plastic bag to the inside of the cooler lid.
13. If the sample will be sent to the lab via a commercial carrier, record the waybill number in the field book.

3.1.2 Samples Collected by the CFU Contractor

The CFU contractor collects more samples related to the AWS Program than any other entity. DEQ may use the CFU contractor to assist with the investigation to determine if a water supply is contaminated by petroleum products. In this role, the CFU contractor usually will collect samples that will be analyzed by a laboratory for the constituents of concern. The CFU contractor also will collect samples related to general water chemistry at the site to aid in the development of a treatment system should one be required for the site.

The AWS Program Manager is responsible for directing the CFU contractor to collect samples from a potentially impacted site. When the AWS Program Manager directs the CFU contractor to collect samples from a potentially impacted site he will usually inform the CFU contractor what analyses to perform based upon the contaminants suspected.

The sampling procedure used by the CFU contractor to determine if a water supply has been impacted will be quite similar to those used by DEQ staff.

1. The CFU contractor will determine the location from which to collect samples. Samples from the water supply system will be collected from the location that is closest to the system pressure tank as possible and is prior to any water filtration conditioning equipment.
2. If an indoor faucet is the most appropriate location from which to collect samples, the CFU contractor will remove any aerator from the faucet prior to collecting the sample.
3. The CFU contractor will purge the system for at least ten (10) minutes before collecting samples.
4. The person collecting the sample will don clean, unpowdered latex gloves before collecting samples.
5. Sample containers will be filled slowly to minimize the loss of volatile constituents and maintain a sufficient level of sample preservative. VOC vials will be capped with a positive meniscus to prevent the formation of air bubbles.
6. After samples are collected, they will be labeled and placed in a cooler on ice.

7. The person collecting the samples will then record information related to the sample in the logbook including the time that the sample was collected, the location from which the sample was collected, the parameters to be measured, preservation used (if any), and sample identification number.
8. After collecting all samples, the CFU contractor will complete the Chain-of-custody form and the necessary lab sheets.
9. The CFU contractor will then keep one copy of the Chain-of-custody form along with the waybill and place this documentation in the appropriate case file in their office.
10. The laboratory, upon completing the analyses, will send the analytical information to the CFU contractor along with the Chain-of-custody form indicating the lab's receipt of the samples. This information should also be placed in the appropriate case file in the CFU contractor's office.

When samples are collected to determine if a water supply has been impacted by petroleum, the CFU contractor will usually analyze water from the site to determine general water chemistry. Parameters often measured in the field to determine general water chemistry at a site include pH, hardness, iron, and hydrogen sulfide. Procedures for analyzing these and other parameters in the field may vary depending upon the test kit and/or instrument used. In all cases, the CFU contractor will perform the analyses for these parameters in accordance with instructions provided by the manufacturer of the test kit and/or instrument used to measure the parameter of interest. The CFU contractor will also ensure that all staff analyzing samples in the field are familiar with and trained to use the test kits and instruments used in the field. A list of and instructions for all test kits and instruments used to analyze water chemistry in the field will be provided to DEQ.

When water is analyzed in the field, the person analyzing the water will record the information obtained from the test kit and/or instrument in the field notebook. This information will be placed in the appropriate case file in the CFU contractor's office and copies of field notes also will be provided to the AWS Program Manager. If the test kit used has a listed shelf life, the person collecting and analyzing samples will record the expiration date in the field notebook. The DEQ will not accept results from test kits that have exceeded the expiration date.

Once DEQ has determined that a treatment system is necessary for the water supply, the CFU contractor will install and maintain the system. Maintenance includes monitoring contaminant concentrations before entering the system and after leaving the system to ensure that the system is operating appropriately.

Table 3-2 Analytical requirements for samples collected by the CFU contractor					
Constituent(s) of concern	Analytical Method	Preservation	Sample Volume	Container	Holding Time
BTEX (and MTBE)	EPA Method 8021B	cool to 4°C	1 x 40 ml	glass 40 ml vial with Teflon cap liner	14 days
volatile organics and MTBE	EPA Method 8260	cool to 4°C	1 x 40 ml	glass 40 ml vial with Teflon cap liner	14 days
semi-volatile organics	EPA Method 8270	cool to 4°C	1 x liter	glass amber liter bottle with Teflon cap liner	7 days

3.2 Sample Handling Requirements

Proper sample handling is necessary to minimize accidents and ensure sample integrity. Samples collected for the AWS program will be labeled (tagged) immediately after collection, wrapped in a plastic sleeve or other protective covering to prevent breakage of the sample container, and placed on ice. Although not required, it is recommended that staff and the CFU contractor place the sample containers in plastic bags. The samples will then be delivered or shipped to a laboratory for analysis.

3.3 Analytical Method Requirements

The DEQ has a no-tolerance practice for petroleum constituents in private drinking water wells. If petroleum constituents are encountered in a private well, the AWS Program Manager will instruct the CFU contractor to install and maintain a treatment system on that well until petroleum is no longer detected in the well or another petroleum free drinking water source is provided to the impacted person(s).

The DEQ practice of installing and maintaining treatment systems on all impacted private water supplies places a high degree of importance on sample analyses. Analyses performed must have low detection limits in order for DEQ to adequately protect human health. Samples must be placed in appropriate containers and analyzed in accordance with established method requirements.

Samples collected by DEQ staff will be analyzed by personnel from DCLS in accordance with DCLS standard analytical procedures (need reference for DCLS analytical manual). Containers and maximum holding times for DCLS analytical methods used by the AWS Program are listed in Table 3-1.

3.4 Quality Control Requirements

Quality control refers to the series of procedures and activities that are performed to ensure that the data collected meet the established standards. Within the context of the AWS Program, the primary purpose of quality control is to ensure that the sampling and analytical protocols are properly executed and that errors in the data set are recognized and corrected before DEQ staff make a decision using erroneous data or data that are of insufficient quality to support the required decision.

3.4.1 Quality Control Samples

When DEQ staff collect water samples from a water supply system, the primary objective is to determine if the water system is contaminated by petroleum constituents. Contamination may, in some instances, be obvious and samples are analyzed to confirm the type(s) of contaminants present and provide information for the preliminary design of an alternate water supply. Most of the time, however, impacted water supplies are reported to DEQ when a constituent becomes detectable via a faint taste or smell and the contaminant concentration in water is less than 100 ppb. In order to determine if contaminants in a sample may have been introduced by the sample container, preservative, or sampling procedure (including environment), staff are encouraged to collect a field blank along with the other samples that they collect during their investigation.

3.4.1.1 Trip Blanks

The purpose of trip blanks is to determine if the sample container, preservative, or transportation process may be introducing contaminants into the samples. Trip blanks are often prepared by the laboratory and consist of the appropriate sample containers and preservative that are filled with reagent grade water. These blanks are then placed in the cooler, taken into the field, and analyzed in the lab along with the samples collected in the field (see note below). Trip blanks are then analyzed for the same parameters or constituents as the other samples. Trip blanks do not need to be analyzed if the constituents of concern in all other samples collected and analyzed from that trip are below the detection limits.

The need for quality control, even at AWS sites, may vary depending upon the stage of work at the site. Perhaps the most critical phase is the initial investigation where DEQ must determine if the water supply is contaminated. One VOC and one SVOC trip blanks will be prepared when samples will be collected as part of the initial investigation and these trip blanks. Once a CFU has been installed at a site, the CFU contractor will periodically check the operation of and maintain the system. During these O&M checks, the CFU contractor may collect samples of both the raw and the treated water. Trip blanks will be used by the CFU contractor at a rate of one per every fourth O&M sampling event at a site or as directed by the AWS Program Manager.

3.4.1.2 Field Blanks

Another type of quality control sample that staff and the CFU contractor should collect is a field blank. Field blanks also may be called sampling blanks and the purpose of field blanks is to determine if the sampling procedure or environment within which the samples are collected may be introducing contaminants into the samples. Field blanks should be collected by placing reagent grade water into an appropriately preserved sample container at the location where other samples are collected. Once the field blank is collected, it is labeled and placed in a cooler along with the other samples. During the process of determining if a well is contaminated by petroleum, samples will be analyzed for volatile organic constituents. Field blanks that are analyzed should also be analyzed for VOCs since these constituents are more likely to be present as a result of cross contamination than are the SVOCs.

NOTE: The purpose of analyzing field blanks is to determine if the sampling procedure or environment within which the sample is collected is contributing contaminants to the sample. If constituents of concern from all other samples collected at the site are below the detection limits, there is no need to analyze field blanks submitted with the samples.

One field blank will be collected at each site during the initial investigation phase of work. After a site has received a system and subsequent samples are collected as part of the O&M program, a field blank should be collected during every fourth sampling event.

3.4.2 Laboratory Quality Control Procedures

Samples collected by DEQ staff must be sent to the Virginia Department of General Services, Division of Consolidated Laboratory Services (DCLS) for analysis. Samples analyzed by DCLS must be analyzed in accordance with DCLS QA/QC protocols for the analyses requested.

Samples collected by the CFU contractor will be sent to a private lab for analysis. The Storage Tank Program expects these samples to be analyzed by one or more of the EPA SW-846 Methods Listed in Table 3-2. Samples analyzed by a SW-846 Method must meet the Quality Control requirements specified in SW-846.

The EPA Drinking Water and Waste Water Analyses are similar to the SW-846 methods for the same analytes and the DEQ Storage Tank Program will accept samples analyzed by a Drinking Water or Wastewater method. Labs analyzing samples by a Drinking Water or Wastewater method must meet the Quality Control requirements specified for the analysis performed.

3.5 Data and Document Management

Storage Tank Program staff in both the regional offices and OSRR and the CFU contractor all contribute to the base of information collected for a site and all of these entities, either directly or indirectly are involved in the decisions that are made about the site. A key component of the decision making process is the availability of information. Data and document management consists of the systematic storage and

retrieval of information related to the AWS Program.

3.5.1 Data Management

There are three basic types of data that are managed under the AWS program. These three types are site data/information, water quality information, and financial information.

When a report of a potentially impacted water supply is received, a Case Manager in one of the Regional Offices will investigate the complaint and obtain additional site information such as site location, potential contaminant sources, and site owner's name, address, and phone number. The regional Case Manager will then provide this information to the AWS Program Manager via phone, fax, or e-mail. Upon receipt of the site information, the AWS Program Manager prepares a file folder for each new site and prepares a new record(s) in the AWS module of the CEDS database.

Water quality information is provided to the AWS Program Manager in the form of laboratory analytical reports. These laboratory analytical reports are from laboratories used by the CFU contractor or from DCLS if the sample(s) were collected by DEQ staff. Copies of laboratory reports are attached to the respective site report prepared by the CFU contractor. Laboratory results from samples collected by DEQ staff are provided to the Case Manager or person who collected the samples. This person is responsible for copying the analytical results, filing the originals in the appropriate case file at the regional office and mailing or faxing the copies to the AWS Program Manager. The AWS Program Manager records laboratory analytical data in the AWS module of the CEDS database. Hard copies of analytical data are filed in the respective site file folders.

Financial information for each AWS site refers to costs expended for AWS measures. These costs are typically in the form of invoices from the CFU contractor. Municipal AWS costs can also take the form of inter-agency agreements that have been negotiated for public water supply water line extensions and hookups.

The AWS Program Manager is responsible for reviewing, approving, and processing CFU contractor invoices for payment. When approved for payment, the AWS Program Manager enters the invoice/cost information into the AWS database module. Hard copies of invoices and approval forms are filed in the respective AWS case files.

3.5.2 Document Management

Documents generated as part of the AWS Program include analytical data sheets, field notes, and CFU contract related documents. Field notes may be taken by DEQ Regional staff, the AWS Program Manager, OSRR staff, and the CFU contractor. Field notes should be recorded in a bound notebook. Copies of field notes taken by regional staff should be placed in the pertinent case file at the Regional Office. Copies of field notes taken by the AWS Program Manager, OSRR staff, or the CFU contractor should be placed in the pertinent AWS case file in OSRR.

3.5.2.1 Document Management - DEQ Regional Offices

Most of the sampling and investigatory work performed by DEQ will be performed by the Regional staff. After performing a site visit, staff should make a copy of their field notes and place those notes in the appropriate case file. When samples are collected by the Regional staff, the original laboratory data sheet(s) received from DCLS must be placed in the pertinent case file at the regional office. If the data indicate that the well is impacted by petroleum, the Regional Case Manager must also provide copies of the lab sheets to the AWS Program Manager.

3.5.2.2 Document Management - OSRR

The majority of samples collected at most AWS sites are collected by the CFU contractor. Copies of analytical results for samples collected by the CFU contractor must be provided to the AWS Program Manager and placed in the appropriate AWS file in OSRR. The AWS Program Manager will send copies of analytical results from samples related to well water quality to the Regional Office upon request.

After a treatment system is installed on an impacted water supply, the CFU contractor will perform regular operation and maintenance on that system. Part of operation and maintenance is the collection of samples to monitor system effectiveness and ensure that the system is removing petroleum from the water before persons are exposed. Copies of analytical results related to system operation and maintenance must be provided to the AWS Program Manager.

The CFU contract is managed entirely by the AWS Program Manager and OSRR. All documents related to the AWS contract such as invoices will be placed in the AWS files in OSRR.

3.5.2.3 Document Management - CFU Contractor

Documents managed by the CFU contractor include field notes taken during site visits, laboratory analytical sheets, chain-of-custody records, and records related to the calibration and maintenance of equipment used to analyze water samples. The CFU contractor is expected to maintain individual case files for each AWS case. Field notes, laboratory analytical sheets, chain-of-custody records and other site specific information should be placed in the appropriate case file. The CFU contractor must provide the DEQ AWS Program Manager with copies of all analytical sheets and field notes. Chain-of-custody records must be provided to the AWS Program Manager as requested by the DEQ.

3.6 Instrument/Equipment Testing, Inspection, Calibration, and Maintenance

The quality of data collected from a site is dependent upon the instruments and other types of equipment that are used to collect the data. DEQ staff, the CFU Contractor, and laboratories may use instruments that will collect or analyze data for a site. In all cases, instruments and equipment must be inspected, calibrated, and maintained to ensure the integrity of the data provided.

3.6.1 Instruments and Equipment used by DEQ Staff

DEQ Storage Tank Program staff do not routinely use instruments or equipment to collect information at potential AWS sites. If instruments or equipment are used to collect information about a site staff must:

1. calibrate the instrument in accordance with the manufacturer's instructions; and
2. document in the field notebook when calibration was performed.

Each DEQ office is responsible for maintaining instruments and equipment in accordance with the manufacturer's instructions. When collecting field data with a particular instrument, staff should document in the field notebook the most recent date that the instrument was last maintained.

3.6.2 Instruments and Equipment used by the CFU Contractor

The CFU contractor routinely analyzes water samples in the field using instrument and/or field test kits. Standard operating procedures for individual instruments and field test kits vary depending upon the kit or instrument used. In all cases, the CFU contractor will use the standard operating procedure that is provided by the manufacturer of the test kit or instrument used. Instruments must be calibrated and maintained in accordance with the manufacturer's instructions and instrument calibration information must be recorded in the field notes.

Reagents provided in certain test kits may have a listed shelf life. When a test kit is used in the field, the person analyzing the sample must record the type of test kit used and the expiration date for the test kit or its reagents in the field notebook. Results from test kits that are obtained after the expiration date for the test kit will not be accepted by DEQ.

3.6.3 Instruments and Equipment used by Laboratories

The most critical component in the decision making process for a potential AWS site is the analytical results for water samples analyzed for petroleum constituents. Analyses of water samples for petroleum constituents are performed either in a private laboratory if the samples were collected by the CFU contractor or DCLS if the samples were collected by DEQ. Calibration of equipment used by private laboratories must be performed in accordance with the QA/QC requirements for the analytical method(s) used to analyze the samples. Equipment calibration at DCLS will be performed in accordance with the DCLS QA/QC procedures manual. Maintenance of equipment used to perform analyses will be performed in accordance with the manufacturer's instructions. The AWS Program Manager may require the CFU contractor to provide QA\QC procedures for commercial laboratories used by that contractor.

4.0 PROJECT ASSESSMENT AND CORRECTIVE MEASURES

The process of developing technical procedures for the DEQ Storage Tank Program, either in part or as a whole, is carried out by Storage Tank Program staff and managers within both the regional offices and OSRR. Reviews and assessments of the QA/QC components of the AWS Program will also be conducted by a group of persons from the Storage Tank Program. In order to obtain input from an individual who is outside of the program, the Storage Tank Program will usually request that the DEQ Quality Assurance Officer assist with reviews and assessments of QA/QC procedures.

When assessments identify procedural changes in the program or quality assurance elements that need to be modified, corrective measures will be developed and implemented. The Quality Assurance Manager for the Storage Tank Program is responsible for coordinating the development of corrective measures. The AWS Program Manager, selected persons from OSRR, and a group of Regional Case Managers will assist with developing corrective actions to address the problems identified.

4.1 Management System Review

A management system review is an evaluation of an organization's management practices as they relate to quality assurance. Management system reviews will be performed on the AWS component of the Storage Tank Program to evaluate the effectiveness of existing management procedures designed to assure data quality, the adequacy of resources and personnel devoted to quality assurance functions, the effectiveness of training and assessments, and the applicability of data quality requirements. Management system reviews will also identify areas where quality assurance improvement is needed and areas where noteworthy accomplishments have been made within the program.

The Quality Assurance Manager for the DEQ Storage Tank Program is responsible for coordinating Management System Reviews. The AWS Program Manager, Case Managers from the Regional Offices, and OSRR Management will also participate in evaluating management systems within the AWS Program. The Management System Reviews will examine the following elements of the AWS Program:

1. The overall effectiveness of the quality management system within the AWS Program
2. Procedures, criteria, and schedules for conducting audits related to quality assurance within the AWS Program
3. Responsibilities and authorities of DEQ managers and staff for implementing the Quality Assurance Project Plan for the AWS Program
4. The level of resources committed to implementing the quality assurance component of the AWS Program
5. Procedural changes that may affect quality assurance within the program
6. Corrective actions taken to address deficiencies in QA/QC within the AWS Program

The schedule for conducting Management System Reviews of the AWS program will be based upon time and changes within the program. The interval between Management System Reviews is expected to be approximately one year. Management System Reviews will also be performed when major AWS procedures are changed.

4.2 Data Quality Assessment

Decisions made within the AWS Program are based primarily upon analytical data for samples that are collected by the CFU contractor or DEQ staff. Data must, therefore, be of sufficient and known quality to support decisions made by the DEQ Storage Tank Program Staff.

Data quality assessments will be performed to evaluate data collected for the AWS Program to ensure that the data collected meet the Data Quality Objectives of the Program and ensure that corrective actions are taken if data quality is insufficient. The primary elements of assessing data quality within the AWS Program will be data validation and data quality audits.

4.2.1 Data Validation and Corrective Actions

Analytical data returned to the CFU contractor or DEQ staff from the laboratory must be validated to ensure that the data are of sufficient quality to support the decisions that must be made about the site. The CFU contractor will review and validate data submitted for samples collected by their staff. The DEQ Case Manager or AWS Program Manager will review and validate analytical information for samples collected by Regional staff or OSRR staff, respectively.

4.2.1.1 Holding Time

Holding time is an important element that must be considered when evaluating the quality of data. Persons checking information provided by the lab must review information provided about sample collection date and sample analysis date to ensure that the holding time for the requested analysis was not exceeded. If the holding time was exceeded, DEQ will consider the analytical result received and the type of decision that must be supported by the data. Table 4-1 provides the recommended actions for samples that exceed holding times based upon the purpose of the sample.

When a holding time is exceeded, it is important to determine why the holding time was exceeded in order to prevent or reduce the probability of a repeat occurrence. The AWS Program Manager and the person who collected the sample will review the sampling process used to determine why the holding time was exceeded. If the exceedance was attributed to the laboratory or to a site specific sample collection and handling procedure, the AWS Program Manager should document this conclusion in the appropriate case file. If the review indicates that standard sample collection procedures used by the CFU contractor and/or DEQ staff are causing holding times to be exceeded, the AWS Program manager must notify the Storage Tank Program Quality Assurance Manager. The Quality Assurance Manager, AWS

Program Manager, and the CFU contractor or DEQ Regional Case Managers will revise the sampling procedure as needed to meet the holding times for the samples.

Table 4-1. Decision Matrix for Samples that Exceed the Holding Time

Purpose of Sample Collection	Result	Action
Samples collected to determine if private water supply well is impacted	A holding time is exceeded and the concentration of any petroleum constituent > detection limit.	The sample result will be interpreted by DEQ as indicating the presence of petroleum in the well and DEQ will begin the AWS process. The Regional Case Manager and the AWS Program Manager have the authority to decide if another sample is needed.
	A holding time is exceeded and the concentrations of all petroleum constituents are below the detection limits.	An additional sample must be collected and analyzed.
Samples collected to determine if public water supply well is impacted	A holding time is exceeded and the concentration of any petroleum constituent is above the Virginia drinking water standards or a health advisory issued by the Health Department.	DEQ will begin the AWS process. The Regional Case Manager and the AWS Program Manager have the authority to decide if another sample is needed.
	A holding time is exceeded and the concentration of all petroleum constituents are below the detection limits.	An additional sample must be collected and analyzed.
Samples collected for system design and operation and maintenance:	A holding time is exceeded and the concentration of any petroleum constituent > detection limit and the analytical result is within one order of magnitude of the previous analytical result for that parameter.	The sample result will be used unless the AWS Program Manager believes another sample is needed.
	A holding time is exceeded and the concentration of all petroleum constituents are below the detection limits.	An additional sample must be collected and analyzed.

4.2.1.2 Field Blanks

If a field blank was submitted to the lab, the CFU contractor or the Case Manager will review analytical data provided for that field blank. The presence of petroleum constituents or other organic analytes in a field blank suggests that sample integrity may be compromised and that constituents found in the samples may be from locations other than the water supply well. If any organic analytes are detected in the field blank, staff or the CFU contractor will collect an additional round of samples from the site. A trip blank will be taken into the field by the sampler and the sampler will also collect another field blank. Both blanks will be analyzed along with any other samples collected as a means of assisting the CFU contractor and DEQ staff identify the source of cross contamination should the blanks contain detectable concentrations of organic constituents.

4.2.1.3 Qualified Data

Analytical data sheets provided by the lab should qualify the data presented on the sheet. DEQ staff and the CFU contractor should check the qualifiers to ensure that the data returned by the lab will support the decisions that must be made.

Qualified data may not be able to support the AWS decisions that DEQ must make at a site. Common qualifiers that staff and the CFU contractor may encounter are listed in Table 4-1 along with the corrective actions needed when these qualifiers are encountered.

4.2.2 Data Quality Audits

The Storage Tank Program Quality Assurance Manager is responsible for coordinating audits of data produced by DEQ staff and the CFU contractor for the AWS Program. The audit will primarily evaluate the completeness of field documentation and analytical procedures and quality control results. This audit process primarily involves tracing the documentation that accompanies data from the time of collection to the time that data is used to make decisions. The AWS Program Manager and a group of Regional Case Managers will assist with all Data Quality Audits.

4.3 Technical Assessments

Technical Assessments are conducted to assess the sampling and analytical quality control procedures used to generate environmental data. The DEQ Storage Tank Program will use technical assessments to evaluate procedures used by both staff and the CFU contractor. Elements of the AWS program that may be evaluated in Technical Assessments include equipment used by staff and the CFU contractor, calibration of equipment, personnel qualifications and training, record keeping and documentation, and data management.

The Quality Assurance Manager for the Storage Tank Program is responsible for overseeing Technical Assessments. Case Managers and Technical staff will also be involved in the Technical Assessment process. The Storage Tank Program Quality Assurance Manager may also request assistance from other DEQ staff, including the DEQ Quality Assurance Officer, in performing Technical Assessments.

The AWS Program does not routinely generate a large volume of analytical data. Given the relatively small amount of analytical data generated by this program, the first Technical Assessment for the AWS program will occur approximately 1.5 years after the implementation of the Quality Assurance Project Plan. The Storage Tank Program Quality Assurance Manager and the AWS Program Manager may revise this schedule as necessary to account for changes in the program.

Table 4-2. Data Qualifiers and Required Corrective Actions

Qualifier	Description	Required Corrective Action
J	The analyte was positively identified but the quantitation is an estimation	• Samples collected to determine if a private water supply well is impacted - collect another round of samples • Samples collected to determine if a public water supply well needs an alternate water supply ▸ If the detection limit of the analysis is below the drinking water standard or the health advisory for the constituent(s), no further action is required. ▸ If the detection limit of the analysis is above the drinking water standard or health advisory for the constituent(s), an additional round of samples must be collected. • Samples collected for system design and operation and maintenance ▸If sample is for system design - AWS Program Manager and the CFU contractor will decide if information from an additional sample is needed in order to properly design the system ▸ If the sample was taken after the carbon unit(s) to monitor the system - the CFU should be replaced ▸ If the sample was taken before the carbon filtration units to monitor the concentration of constituents in the raw water, the raw water should be re-sampled.
U	The analyte was analyzed for, but not detected. The associated numerical value is at or below the method detection limit	None provided that the detection limits are appropriate.
R	The data are unusable due to deficiencies in the ability to analyze the sample and meet QC criteria	The data cannot be used to support any decision made about the site and staff or the CFU contractor must collect an additional round of samples from the site.
B	The analyte was found in associated blank, as well as in the sample	The data cannot support decisions that must be made regarding alternate water supplies at the site and staff or the CFU contractor must collect an additional round of samples.

Appendix A

DCLS Lab Sheet and Instructions for Completing the Lab Sheet and Lab Tag

Instructions for Completing the DCLS Lab Sheet

Staff must complete the following sections of the Lab Sheet:

Prog. Code
This two block section refers to the program code to which the cost of sample analysis will be billed.

Station ID
Station IDs will be: PCYYYYX9999Z
Where: YYYY is the four digit year
X is the regional identifier (e.g. S = SWRO)
9999 is the numeric incident code that matches the run ID#
Z is an alpha/numeric code regionally derived for station designation

NOTE: The Station ID is derived from the Run ID which is a CEDS identifier for the site

Date Collected
Contains the date on which the sample was collected (year, month, day).

Time Collected
Fill in the time of sample collection in military time.

Catalog Number
These six blocks, divided in half by a hyphen, are used in conjunction with the group code to indicate the type of analysis being requested. The first three digits are pre-printed with the DEQ agency code (190). the following three digits are used to indicate the analysis being requested. These catalog numbers are found in the "DCLS catalog of Services." Please note that the catalog numbers vary for the same services based on the associated group code.

Group Code
These six blocks are used in conjunction with the catalog number to indicate the type of analysis being requested. the first digit is preprinted with the letter "P" indicating the sample is being received with a lab sheet. The following five digits are used to indicate the analysis being requested. The group codes for analyses to be used for drinking water samples are:

BTEX
SWBW
SVW
VOCW

Priority code
This block on the lab sheet is used to indicate the sample priority. A blank in this area indicates a sample with no priority or a standard turnaround time. A "5" in this block indicates a priority sample. A "4" in this block indicates a high priority sample. All AWS samples should be submitted as high priority samples.

Container #
This set of blocks is used to indicate the number of the container associated with the lab sheet. The numbering scheme is up to the sample collector but a number should not be used more than once during a single sampling event. A "B" may be used in the first block to indicate a blank sample or a "D" may be used to indicate a duplicate sample. The number on the Sample Tag and the number in this block must match.

Unit Code
These blocks are used to indicate the unit or regional office which collected the sample and the unit or regional office which should receive copies of the results. The first three blocks indicate the unit number of the collector. Unit numbers are as follows:

SWRO - 001
WCRO - 002
NRO - 003
PRO - 004
TRO - 005
VRO - 007

Collector
Indicate the person who collected the samples. Use up to three initials to identify the collector.

Latitude and Longitude
Fill in the latitude and longitude of the sample collection location if known.

Other
The person collecting the sample may place additional information about the sample identification in this location (e.g. Jones well). Please note that this information is for the collector's use and cannot be used to locate a sample within DCLS.

County
Fill in the county or city from which the sample was collected

Comments
The person collecting the sample should fill in any comments or observations that they had when collecting the sample (e.g. water smelled like sewage).

Instructions for Completing the DCLS Lab Tag

Use a #2 lead pencil or indelible ink to fill out the lab tag. The information on the back of the lab tag must exactly match the information found on the lab sheet.

Station ID
Fill in the PC#

Date collected
Fill in the year, month, and day that the sample was collected

Time collected
Fill in the time that the sample was collected (military time)

Preserved?
If a preservative was added to the sample container, place a "Y" in this box.

Sample # (___/___)
The sample number refers to the number of containers in the shipment that are associated with a single lab sheet. DCLS analytical procedures require DEQ to provide duplicates of each sample to be analyzed. Fill in ½ on the sample tag for the first sample container and 2/2 on the sample tag for the duplicate sample.